U.S. Department of Transportation
Federal Highway Administration

FHWA is the source of all images in this presentation unless otherwise noted.

FHWA CMIP Tool

Extreme Precipitation in the Northeast Workshop

October 15, 2019 • ICNet • Westborough, MA

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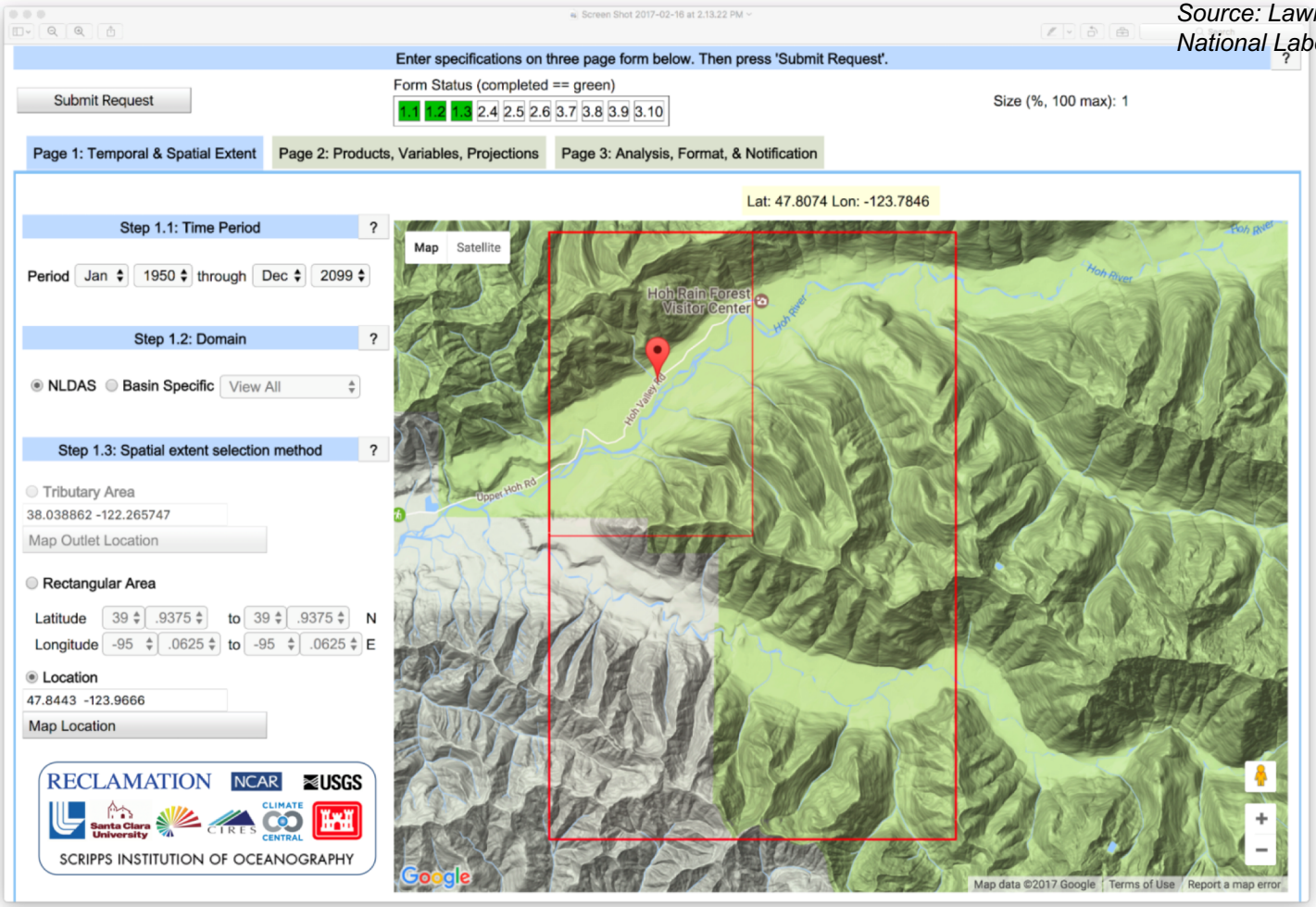
Coupled **M**odel **I**ntercomparison **P**roject Tool

- Named after IPCC World Climate Research Programme project evaluating climate models and projections
- CMIP site: https://www.wcrp-climate.org/wgcm-cmip
- Tool takes output from the **D**ownscaled CMIP3 and CMIP5 **C**limate and **H**ydrology **P**rojections (DCHP) website and renders temperature and precipitation variables of interest to designers/planners

Coupled Model Intercomparison Project Tool

- Tool currently exists (as a spreadsheet) at: www.fhwa.dot.gov/environment/sustainability/resilience/tools/
- New upgraded tool will run faster and use CMIP5 models and refined LOCA datasets
- Should be complete/posted by early 2020
- Tool's User Guide is "required reading"
- Tool may assist with NCHRP project testing methods to incorporate projections into hydrologic computations

DCHP Website



Source: Lawrence Livermore National Laboratory

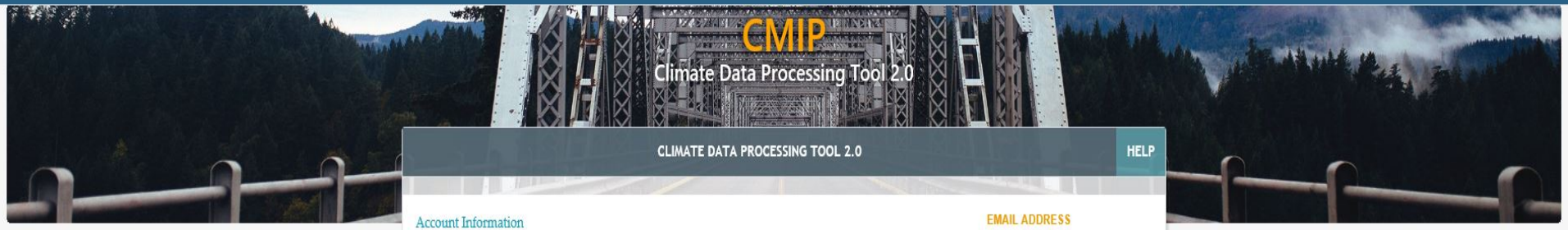
http://gdo-dcp.ucllnl.org/downscaled_cmip_projections

New Tool Features

- Will run on FHWA server rather than tie up the user's computer
- Will run faster and handle larger datasets
- Will assign a grid-naming convention and graphically display results on a map including grid overlay
- Will translate LOCA data from NetCDF format so as to be viewed in Excel
- Will display raw input data as well as a polished report for presentation

New Tool Features

- Will produce annual maximum series for precipitation similar to existing tool
- Will produce precipitation projections in terms of annual exceedance probabilities or return periods (e.g. the 25-year storm)
- User guide will include more direction on selecting models, scenarios, baseline vs. future periods, using confidence limits, etc.
- Exclusively using CMIP5 and LOCA but will accommodate future CMIP projects



CMIP
Climate Data Processing Tool 2.0

The purpose of the **CMIP Climate Data Processing Tool 2.0** is to process readily available downscaled climate data at the local level into relevant statistics for transportation planners.

Click here to access the **User Guide**.

CLIMATE DATA PROCESSING TOOL 2.0

HELP

Account Information

Email Address*

Email address

Confirm Email Address*

Confirm email address

Data Files

This tool works with data from the U.S. Bureau of Reclamation's Downscaled CMIP5 Climate and Hydrology Projections (DCHP) website.

Browse...

Calculation Periods

	From	To
Baseline Period*	0	0
Projected Period*	0	0

☐ Include Raw Data Result

Job Name

Reset Submit

EMAIL ADDRESS

A valid email address is required to use this tool.

CLIMATE DATA SOURCE

Click here to get data from the U.S. Bureau of Reclamation's Downscaled CMIP5 Climate and Hydrology Projections (DCHP) website.

BASELINE TIME PERIOD

Baseline period must end by 1999 (e.g. 1950 - 1999).

JOB STATUS

You have 2 submitted jobs.

SEPT-03-2019	Processing
JUL-23-2019	Completed

I-680 in Iowa during Missouri River Flood of 2011, credit: Iowa State Patrol

USING FHWA RESOURCES TO BUILD RESILIENCE

Extreme weather, sea level change, and changes in environmental conditions threaten the considerable federal investment in transportation infrastructure. FHWA is working with States and metropolitan areas to increase the health and longevity of the Nation's Highways... **» more information**

RESOURCES

Downscaled CMIP5 Climate and Hydrology Projections (DCHP)
FHWA Hydraulic Engineering
FHWA Resilience

POLICIES, RIGHTS, LEGAL

Privacy Policy
Freedom of Information Act (FOIA)
Accessibility
Web Policies & Notices
No Fear Act
Report Waste, Fraud and Abuse

U.S. DOT Home
USA.gov
WhiteHouse.gov
Federal Highway Administration

CONTACT

Federal Highway Administration
1200 New Jersey Avenue, SE
Washington,DC 20590
Phone: 202-366-4000

Deriving Output Variables

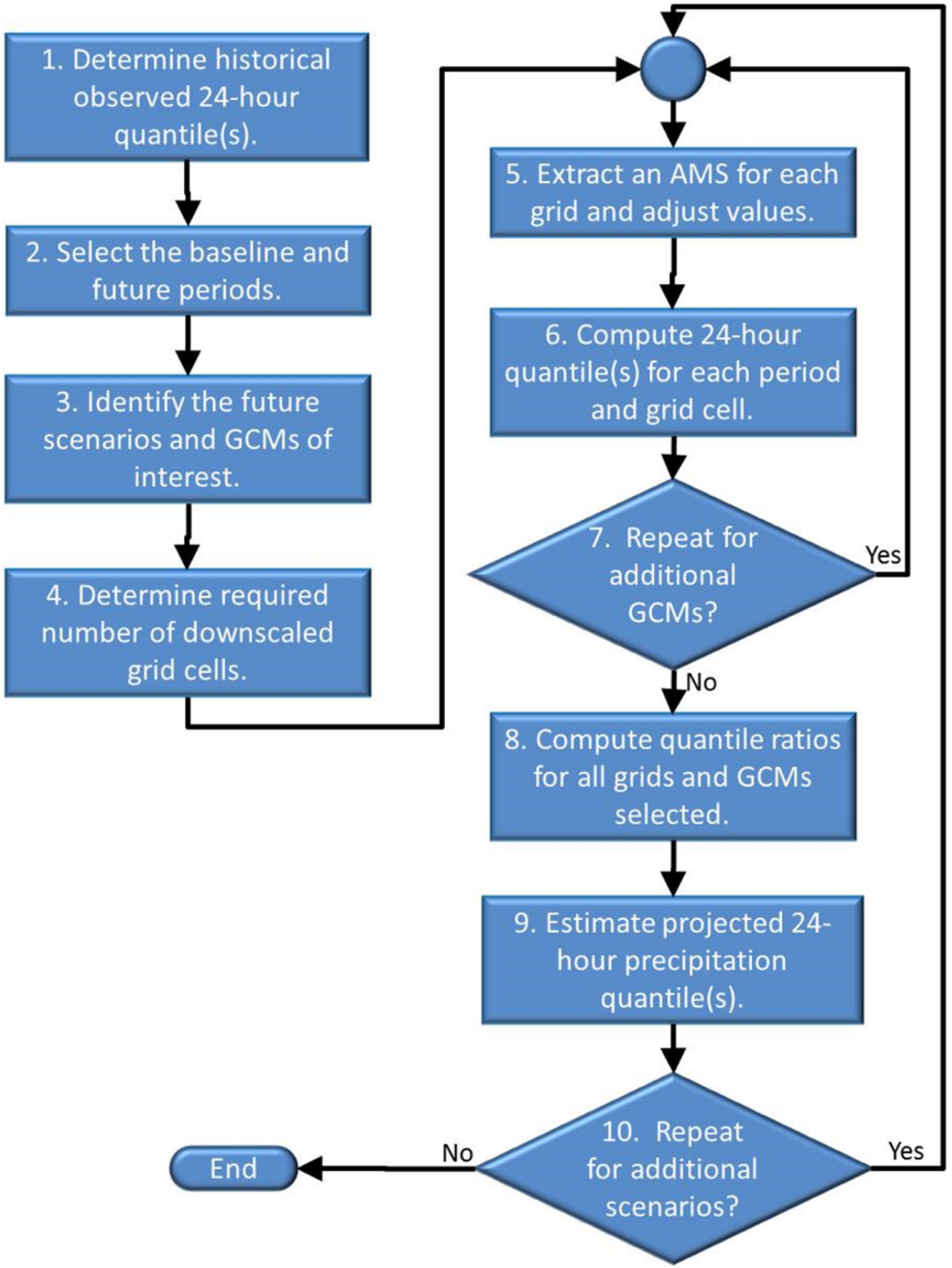
- Input data are simply daily min & max surface air temp (tasmin & tasmax) and precipitation depth (pr)
- Current tool produces a variety of useful temperature and precipitation variables of interest to planners/designers, e.g.,
  - ✓ Hottest/Coldest Temperatures of the Year
  - ✓ Average no. of days above 95°F, 100°F, 105°F, 110°F
  - ✓ Max. No. Consecutive Days per yr above 95°F, 100°F, 105°F, 110°F
  - ✓ Highest 4-Day Average Summer High Temperatures
  - ✓ 95th and 99th percentile precipitation depths
  - ✓ Annual maximum series of precipitation depths, and much more!

Deriving Output Variables

- Return period precipitation projections computed using a “10-step” procedure that essentially ratios future to baseline modeled precipitation data and applies the ratio to observed data
- Procedure was developed as part of NCHRP 15-61 project and evolved from procedures in HEC-17 2nd edition
- Will not attempt to compute sub-daily durations at this point (24 hr minimum)

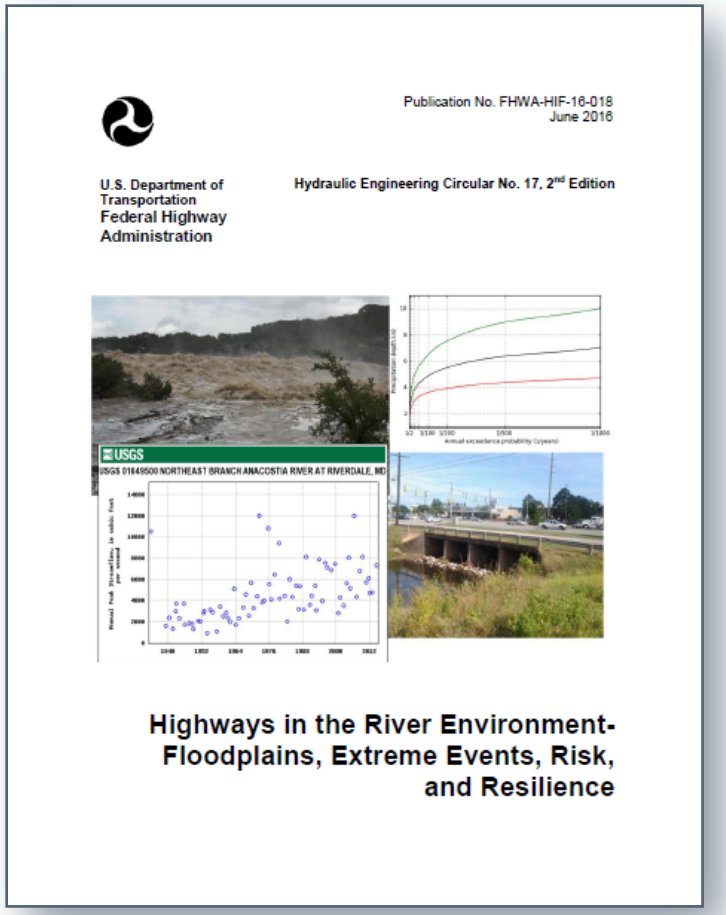
10 Step Procedure

- LOCA models available for RCP 4.5 and RCP 8.5 scenarios
- Use of multiple GCMs allows estimation of confidence limits
- Uses ratios indexed to the more common 10-yr event to estimate more extreme events (e.g. 100-yr event)
- 24 hour minimum durations only



HEC 17: Riverine Resilience

1. Introduction
2. Floodplain Policy
3. Riverine Flooding
4. Nonstationarity
5. Climate Science and Modeling
6. Risk and Resilience
7. Analysis Framework (5 levels)
8. Case Studies



HEC 17 Webinar Series:
www.fhwa.dot.gov/engineering/hydraulics/media.cfm

HEC 17 Link:
www.fhwa.dot.gov/engineering/hydraulics/pubs/hif16018.pdf

HEC 17 Highlights

- Regulatory foundation and background for resilient design
- Overview of typical hydrologic design methods
- Climate Science and Modeling 101
- Defining Risk with respect to remaining design life
- Evaluating over a range of events vs. a single design event
- Strategies to reduce vulnerability and increase resilience
- Five level risk/vulnerability assessment framework
- Test to assess significance of future precipitation changes
- Five case studies illustrating various levels of assessment

Photo courtesy Brian Beucler

NCHRP 15-61

- Applying Climate Change Information to Hydrologic and Hydraulic Design of Transportation Infrastructure
- Objective is to develop a design guide of national scope to provide hydraulic engineers with tools to account for future climate in designs
- Two deliverables: Final report (research findings) and best practices (design) guide that engineers can easily use
- Current status: Draft final report and draft design guide have been completed. Stay tuned.
- Looking at both inland and coastal (SLR) methods

15-61 Link: http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=4046

Webinar: https://www.youtube.com/watch?v=gCcOE9atnpE&list=PLvW4wAljXpNApjs_zWtoZkcSFvFeEamJB&index=36&t=0s

Thank you…Questions?


Photo courtesy Brian Beucler

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